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## Audit Techniques for Data Processing Systems; An 8 Quarter Credit Hour Research Option

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Audit Techniques for Data Processing Systems

An 8 Quarter Credit Hour Research Option

Presented To

The Faculty of the College of Business

Rochester Institute of Technology

.

In Partial Fulfillment

Of the Requirements for the Degree

Master of Business Administration

By

William E. Perry

August, 1972

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## CHAPTER I

### INTRODUCTION TO COMPUTER AUDIT TECHNIQUES

Numerous articles have eluded to the apathy of auditors to become involved in the computer environment. The mere fact that it is possible to audit without any significant involvement with the computer has lent some credence to the view of auditing around the computer. The two terms, "auditing around the computer" and "auditing through the computer," themselves have been an inhibiting factor in audit involvement in E.D.P. (Electronic Data Processing) in that the semantics of these terms appear to offer a choice between two alternatives.<sup>1</sup>

However, recent articles indicate that the accounting profession is beginning to assume a more proper role in the design, development, and direction of computerized systems. The time is none too soon because emerging trends in E.D.P. systems are having an impact on the effectiveness of many well established and understood control techniques. On-line systems with remote terminals permit transactions to be entered from multiple sources thus losing batch type controls, and large integrated systems make tracing a chain of events a difficult if not impossible task.<sup>2</sup>

<sup>1</sup> Irving J. Sandler, Plain Talk About Auditing in an ADPS Environment, (The Journal of Accountancy, April, 1968, pp. 43-47), p. 45.

<sup>2</sup> William D. Lang, Jr., New Controls Needed, (Administrative Management, July, 1971, p. 12), p. 12.

The computer environment provides unusual opportunities for error and fraud. The characteristics of E.D.P. most often overlooked by the traditional auditor are:

1. The tremendous calculating speed of the computer. The repetition of very small thefts, the kind that years ago we would have nothing to do with, can today be added to sizable sums as a result of this speed.
2. The invisibility of records. Generally speaking, that which can't be seen can't hurt us.
3. The use of programmed processing controls. Cut-off and numerical processing, a processing control difficult to circumvent on a<sub>3</sub> manual system, can be omitted in a computer system.

Couple the apathy of many auditors with the characteristics of E.D.P. system and the resultant situation becomes a problem in which to obtain proper audit verification.

The statements on Auditing Procedure No. 33 give the following two standards of field work for:

1. Evaluation of Internal Control

There is to be a proper study and evaluation of the existing internal control as a basis for reliance thereon and for the determination of the resultant extent of the tests to which auditing procedures are to be restricted.

2. Evidential Matter

Sufficient competent evidential matter is to be obtained through inspection, observation, inquiries, and confirmations to afford a reasonable basis for an opinion regarding the financial statements under examination.

<sup>3</sup> Bruce P. Olson, EDP - The Embezzler's Tool, a presentation to the 1966 International Conference of The Institute of Internal Auditors.

In the computerized environment, the control function requires special attention. The removal of personnel from direct interaction with events and transactions and relying on computer systems places a greater burden on control points throughout the organization. The transition from men to machines has often created control gaps which have allowed costly mistakes to go uncorrected.

The solution to the problem of control in an E.D.P. environment is to restructure control and audit techniques to compliment the characteristics of the computer systems.

The intention of this paper is to review the state of the art of computer audit techniques, propose the integrated test facility technique as one of the most promising tools for computer audit, propose some hypotheses regarding the integrated test facility technique, survey the private accounting community to test the validity of these hypotheses, and conclude with the implications of this research.

## CHAPTER II

### REVIEW OF THE LITERATURE

#### 1. Growth of E.D.P.

The computer has been described as the dominant advance of the 20th Century. Where the factory machine freed the hands of the worker from the burdensome tasks of manual labor, the computer is the equivalent to the office worker in that it is freeing his mind from burdensome clerical tasks. This technological revolution is drastically changing the way organizational administration operates.

Economists have predicted that by the end of this century more people will be employed in data processing and related industries than in any other single business.<sup>4</sup> The first electronic computer was developed during the early 1940's; but it wasn't until March, 1951, that the first commercial installation of a computer was made. At that time, the United States Bureau of the Census took delivery of the first UNIVAC manufactured by the Remington Rand Corporation. After that, historic installation progress was rapid. Seven years later, in early 1958, over 1,250 computers had been installed; and by mid-1962, this figure had increased to almost 9,500 installations.<sup>5</sup>

<sup>4</sup> J. R. Bradburn, Where is the Computer Industry Heading, (Computers and Automation, Volume 19 Number 1, January, 1970), p. 10.

<sup>5</sup> Dick H. Brandon, Management Standards for Data Processing, (Princeton: D. Van Nostrand Company, Inc., 1963), pp. 2-3.

At that time, Mr. Brandon extrapolating this curve projected that the installed computer population of the United States would be over 14,000 by 1965, and possibly 20,000 by 1970.<sup>6</sup> By early 1966 there were 27,000 installed computers in the United States. Business Week of February 19, 1966, in a mid-decade projection, predicted there would be 45,000 installed computers in 1970. This projection was surpassed in 1968; and by 1970, approximately 70,000 computers were installed.<sup>7</sup>

It hardly seems necessary to document the impact the computer has had on the accounting function. Peter Drucker states that the truly revolutionary aspects of this era are in the changes in the education of the work force, in job content, in business structure, and in the job and role of the businessman. He further states the strategy for raising productivity has shifted from brawn to brain.<sup>8</sup>

## 2. History of Computer Auditing

Mr. James Kobak of J. K. Lasser & Co., in a talk at the Sixth Annual A.I.C.P.A. Computer Conference entitled "You Have Ruined My Nice Comfortable, Happy Life, and I Hate You All," commented on the question as to where are we really in the computer field?

<sup>6</sup> Ibid, p. 3.

<sup>7</sup> James C. Hammerton, Credit Clearance - The Slow Change to EDP, (Datamation, February 15, 1971), p. 36.

<sup>8</sup> Peter F. Drucker, Preparing Tomorrow's Business Leaders Today, (Prentice-Hall Inc., Englewood Cliffs, New Jersey, 1969), pp. 2-3.



He answered: "One man sitting at a console can still wreck an auditor's whole scheme of life - but most accountants don't know it. They're still arguing about 'around the computer' and 'through the computer' when we've barely scratched the field in this audit area. And that's a desperately critical area."<sup>9</sup>

The textbooks on auditing reveal some insight as to how auditors have viewed E.D.P. The 1957 edition of Montgomery's "Auditing" offers the following conclusions in the section on "Machine Book-keeping":

"Although the mechanics of auditing have to be adapted to machine bookkeeping, the fundamental purposes of auditing remain the same. Difficulties may arise in preserving a trail that can be audited, and the auditor will be forced to use his ingenuity in following information from the ultimate results back to original data. Internal accounting control will probably be affected, but it may not be weakened if proper division of duties is maintained; in fact, it may be strengthened since the mathematical accuracy of electronic machines is infinitely greater than that of human beings."<sup>10</sup>

This view was typical of the early reaction of the auditing profession to electronic data processing. The tendency was to rely on conventional audit techniques.

A more recent textbook on auditing, the 1962 edition of Holmes' "Basic Auditing Principles, answers the question (for that time period) of what is the impact of E.D.P. on auditing, as follows:

<sup>9</sup> A Management Advisor Staff Report, Sixth Annual AICPA Computer Conference, (Management Advisor, May-June 1971, pp. 49-58), p. 58.

<sup>10</sup> Robert H. Montgomery, Auditing, (New York: Ronald Press, 1957), p. 766.

"The principles of auditing remain unchanged under any accounting system, but the application of recognized audit procedures is changed. With punched card and electronic applications in operation, the auditing follows the pattern of a thorough examination of internal control and of the programming, followed by tests to determine that the internal control and the programming are being followed and that the results are correct. As the application of electronic analyses increases, auditing will become more and more an analysis of internal control and programming, followed by tests of the programming."<sup>11</sup>

Although it is confusing to mix up punched card systems and E.D.P. systems, the interest of auditors in E.D.P. was starting. Unfortunately, Holmes never explained what he meant by the phrase "a thorough examination of the programming" which is the important change that was beginning to occur in auditing.

Acceptance by auditors that E.D.P. was changing their world was far from universal at that time. In June, 1965, the American Institute of Certified Public Accountants engaged the System Development Corporation, Santa Monica, California, to undertake a six-month research program on the impact of computers on the public accounting profession.<sup>12</sup>

The results of this study were published in five separate computer research studies. Again, the study showed an increasing awareness of the computer. Forty percent of the firms answering

<sup>11</sup> Arthur W. Holmes, Basic Auditing Principles, (Homewood, Illinois: Richard D. Irwin, 1962), p. 370.

<sup>12</sup> System Development Corporation, Computer Research Study No. 1, (New York: AICPA, Inc., 1966), Forward.

the questionnaire indicated that they had one or more staff members with E.D.P. experience, and the same percentage of firms participated in E.D.P. engagements.<sup>13</sup> Another interesting major conclusion was that a small but significant number of firms reported that they have lost engagements because someone else offered E.D.P. service.<sup>14</sup>

In 1967 the first computer audit extract package designed specifically for auditors was developed. The package was produced by Haskins & Sells and was called Auditape. Auditape was described as a set of generalized computer programs that can be useful for a variety of audit purposes.<sup>15</sup>

During 1966, major efforts were undertaken by both the Institute of Internal Auditors (I.I.A.) and the American Institute of Certified Public Accountants (A.I.C.P.A.) to publish material to be used as guides in auditing data processing systems. In 1967, the I.I.A. issued an "I.I.A. E.D.P. Manual;" and the A.I.C.P.A. followed in 1968 by publishing a book entitled "Auditing & E.D.P." The floodgates were then opened and a continuous stream of articles has been published since.

<sup>13</sup> Ibid., pp. 14-15.

<sup>14</sup> Ibid., p. 23.

<sup>15</sup> Haskins & Sells, Auditape System Manual, (U.S.A.: Haskins & Sells, 1967), p. 1.

The middle to late 1960's saw the auditors seriously wrestling with E.D.P. spurred on by the ever present critic of the profession. Typical of these critical comments are: "In too many cases, the computer and auditor are relative strangers;" and "Companies are trying to do today's work with yesterday's auditors as too many of them never have become really involved with computer systems." Both of these quotations were made by Joseph J. Wasserman who started a consulting firm to deal specifically with the problem of E.D.P. auditing.<sup>16</sup>

The period of the late 1960's fostered the test deck concept in which auditors prepared hypothetical transactions and master file data, and these were used to test internal computer processing procedures.<sup>17</sup> At about the same time, the Bell System was experimenting with a refinement of the test deck approach. Their new concept was the "Mini Company" concept in which an imaginary company was established to test internal computer processing procedures.<sup>18</sup> (This concept will be discussed in detail in several of the following chapters of this paper.)

<sup>16</sup> Computerworld Staff, Auditors Told to Learn How to Cope With E.D.P., (Computerworld, October 22, 1969), p. 5.

<sup>17</sup> John J. O'Donnell, Jr., E.D.P. and Auditing in Perspective, (New York: Lybrand Journal, Volume 49 Number 3, 1968, pp. 3-13), p. 9.

<sup>18</sup> Joseph J. Wasserman, The Vanishing Trail, (Bell Telephone Magazine, July/August 1968).

A recent dissertation project survey indicated that the majority of the large industrial firms are now actively involved in auditing E.D.P., with the more aggressive smaller industrial firms gaining from the experience of the leaders. Truly, the pendulum has swung in favor of audit involvement in E.D.P. It is still early in the age of computer auditing, but the momentum has started to build.

An extract from the unpublished dissertation on "Control of Computerized Finance and Accounting Systems" perhaps best illustrates current involvement in E.D.P. auditing:<sup>19</sup>

Question from survey: Does your firm have a department separate from finance, accounting, and data processing that is responsible for evaluating the controls in computerized finance and accounting systems?

(NOTE: In this study, the independent evaluation agency was designated Internal Audit. It is so called throughout this report.)

TABLE I

Firms Reporting the Establishment of an Independent Department for the Evaluation of Controls in Computerized Finance and Accounting Systems

	Firm Size Category <sup>a</sup>				
	Sales in Millions				
	<u>50-100</u>	<u>100-250</u>	<u>250-500</u>	<u>Over 500</u>	<u>Total</u>
Total Respondents	194	185	100	155	634
Firms With an Internal Audit Department:					
Number	19	44	44	94	201
Percent of Respondents	9.8	23.8	44.0	60.6	31.7

<sup>a</sup>The differences between categories are statistically significant at the .05 confidence level.

<sup>19</sup> Francis A. Cooch, Control of Computerized Finance and Accounting Systems, (George Washington University, unpublished dissertation, June 1972).

### 3. Controls in an E.D.P. Environment

The general approach to successful control is unchanged in the computerized environment. The general steps are: 1) developing rules and standards of performance, 2) planning and designing control mechanisms, and 3) developing procedures to insure that the mechanisms are functioning and resulting in corrective action when needed.

The scope of the control problem is reduced with the computer. The consistency factor inherent in computer applications eliminates the need for constant review of transactions handling to determine if they were mechanically processed according to authorized procedures. The operational computer system ensures the consistent handling of data. The system is structured around "preproblem" decision making. Once the rules are developed and designed into the program components of the system, it becomes unlikely that the same event would be handled differently. This is a departure from the traditional control problem. For example, in a manual situation, a billing clerk may or may not rebate freight charges on returned goods. Even though policy may dictate the proper method, the clerk evaluates the particular situation and makes a decision. The rules may have been designed to be flexible, but the clerk's interpretation adds an additional variable. Having decided to rebate the freight charge, the clerk then decides how he will do it. A larger discount on the next purchase, a credit adjustment,

a cash refund, or prepaid freight on the next shipment are alternatives open to him. Again, established policies and his supervision serve to guide his actions. And finally, depending on earlier decisions, when he effects the adjustment may become another decision point. Next order, next period, or when he remembers it are alternatives. In the computerized system, the decisions are less flexible. The situation was analyzed in the design stage, and inflexible "decision rules" were built into the computer programs. In other words, given certain facts, the same decision will be made (the credit will or will not contain freight charges). Even if the ability to override the "decision rules" exists, the well-designed system should conspicuously report on the deviation.

From a control standpoint, in the computerized system, once it has been determined that a particular event is being handled correctly, there is little need to continuously recheck that particular process. The central control problem is assurance that the proper decision rules were designed, implemented, and are functioning within the system.

A second characteristic that reduced the scope of the control problem in the computerized system is the exacting nature of input requirements. Returning to our earlier example of the billing clerk, he may have decided to issue the credit after receiving notice that the returned shipment had been received. He assumes or believes that it was the identical materials originally shipped.

The computer system, however, requires data about the shipment and consistently applies rules to that data. Only after the required information passes the decision rules will the transaction be accepted. Implications to controlling the system are significant. Less emphasis is required on elements of supporting documentation and more concern with how the data requirements are handled within the system.

With the advent of E.D.P., many auditors have been somewhat shocked to find so many new business information systems being implemented with what often appears to be serious disregard for basic internal control principles. This dismay is usually justified. Audits normally reveal weak internal controls and raise serious questions about the competence of key data processing personnel.

Although not consistently so, the auditor discovers that the data processing organization simply cannot be relied on to provide adequate controls within the computer systems that they themselves design and implement.

Some of the underlying reasons that tend to support this situation are:<sup>20</sup>

1. E.D.P. personnel often do not have enough detailed familiarity with all of the control requirements directly and indirectly related to the applications that they are responsible for automating.

<sup>20</sup> Jerome Lobel, Auditing in the New Systems Environment, (The Journal of Accountancy, September 1971, pp. 63-67), p. 65.



2. The orientation of most E.D.P. personnel is related more to technical design and accomplishment than operating effectiveness. They think that they are primarily responsible for getting the system designed, debugged, and "on the air." In addition, they tend to believe that this is the basis on which they will be evaluated or measured, come salary review time.
3. Important policy and procedural decisions are being made by relatively low levels of staff in the company's E.D.P. operation. Many of these decisions involve controls, but too often the people making the decisions do not have sufficient background or authority to make them. They do make these decisions, however, in the absence of other management direction.
4. Controls once included in the initial design or even implemented are occasionally ignored or deleted from the system without the approval or knowledge of responsible individuals.
5. E.D.P. staffs attempt to design systems that will operate at lowest cost and greatest speed. The inclusion of internal control devices works against this objective.

The emphasis of auditing in noncomputer operations is directed toward human frailty, but in computer operations the emphasis should be on the human frailty built into the system. The type of actions that a clerk would take on an exception item in a manual system must now be defined and programmed into a computer system.

Controls within a computerized environment can be divided into five categories:<sup>21</sup>

<sup>21</sup> H. Washbrook, Computer Systems and Internal Audit, (The Accountant, March 29, 1969, pp. 435-438), pp. 436-437.

1. Overall standards concerned with the organization of the computer department, the interaction of one section upon another, the way in which jobs are tackled, and the division of responsibilities.
2. The standards applied directly to the system analysis and programming aimed at compelling systems analysts and programmers to tackle problems in a standard way.
3. The standards applied directly to computer operations so that the operation of the computer center is uniform and such that it enables the detection and recovery of errors which have been made innocently, and to make deliberate misoperation difficult.
4. Within the computer department there should be an internal control section. This section should not be supervised by systems analysts or programmers and should exercise control on the input to the computer and the output therefrom in an accounting manner.
5. Wherever possible, checks, audits, and controls should be built into the computer system. This would be impossible on a manual basis but is one of the great advantages of the computer over a manual system.

It is generally recognized that the use of E.D.P. equipment has posed some unique problems to those concerned with maintaining strong internal accounting control. With the concentration of duties in the data processing center, the supervisory personnel are in an unusual position to manipulate records.<sup>22</sup>

<sup>22</sup> Edward J. Lynott, Use of Computers in Auditing, (New York, Price Waterhouse & Co., 1963), p. 11.

The number of cases of fraud linked directly to a computer system, however, remains low. As recent as late 1968 a survey failed to cite a single notable instance of fraud through the use of the computer.<sup>23</sup> However, many millions have been lost due to computer systems not operating correctly. One only has to read the daily "Help" columns to be aware of the control problems in computerized systems.

An interesting approach to control in an E.D.P. environment is being tried in England. The British Computer Society (B.C.S.) has issued "The B.C.S. Code of Good Practice" which lists those practices that should be followed in a computer installation. The manager of the computer installation is responsible to operate his installation according to the "code," but the junior staff member is responsible to bring departures from the "code" to the notice of his manager.<sup>24</sup>

The need for data security exists whether the information is in a manila folder, punched cards, or a direct access device. However, the concentration of data in a central location, the increased use of telecommunications in transmitting data, and the multi-programming capability of computers has increased the need for control over data.<sup>25</sup> The benefits from modern E.D.P. systems

<sup>23</sup> Modern Office Procedures Staff, Halting the Electronic Hijacker, (Management Review, November 1968, pp. 45-55), p. 45.

<sup>24</sup> British Computer Society, Draft Code of Good Practice, (The Computer Bulletin, January 1972, pp. 52-62), p. 53.

<sup>25</sup> International Business Machines, The Considerations of Data Security in a Computer Environment, (I.B.M. Manual 520-2169-0, 1969).

are dramatic. However, as access to information is extended outward to various operating levels, security measures must correspondingly extend outward to control this access.

Lastly, we should look at the reason why so many companies have lost control, at least temporarily, of their computer organization. As the majority of computer installations start their growth, they unconsciously establish two characteristics that seriously affect their ability to be controlled. First is that the primary measure of success in a computer center is whether or not the work gets done without serious complaint by the users. The second characteristic is that management assumes those people directing the work know what they are doing and, therefore, do not require extensive supervision or management review.<sup>26</sup>

#### 4. Computer Audit Techniques

The first decade of computer auditing was basically traditional audit approaches that made use of computer listings. In general, this was the around-the-computer approach. Because most systems used the computer as a large calculator, this audit method worked.

The first guide for E.D.P. auditing was published by the Department of the Air Force during July, 1966. This guide listed the objectives of a "through-the-machine" approach to auditing.

<sup>26</sup> Leighton F. Smith, An Executive Briefing on the Control of Computers, (Park Ridge, Illinois, DPMA, 1971), p. 6.

The guide indicated that the E.D.P. audit must determine:

1) whether all of the audited input is actually introduced into the processing system, 2) that unusual conditions in the input data will not cause undetected mishandling during the processing, 3) that the incidence of error due to mechanical difficulties is acceptably small, and 4) that the activities of the machine operators cannot cause undetectable irregularities in the final results of the system.<sup>27</sup> The method proposed to do this auditing was basically a checklist approach.

In discussing audit techniques, one must first consider what type of training or knowledge should an auditor have to be effective in E.D.P. audits. The following four items are generally recognized as the minimum requirement for an auditor involved with data processing systems:<sup>28</sup>

1. He should know and understand what he sees when he enters the computer systems environment. That is, he must recognize how and why the data are manipulated by the system, how the system is organized, and how effective are its internal controls.
2. He should be able to identify visually all of the major system components and be able to discuss the functions of these components in a fairly lucid manner with the people who design, program, or operate the system.

<sup>27</sup> Department of the Air Force, Guide for Auditing Automatic Data Processing Systems, (Washington, D.C., U.S. Government Printing Office, 1 July 1966), pp. 8-8 and 8-9.

<sup>28</sup> Jerome Lobel, op. cit., p. 66.

3. He should be able to recognize the important weaknesses and strengths that affect the internal control of the particular systems he is responsible for auditing.
4. He should be able to recommend changes in the design or operation of the system that may be needed to resolve potential control problems.

With this type of background, the auditor is now ready to begin computer audits. There are several categories of techniques that are applicable to computer auditing. They are:

1. Checklists.
2. Systems approach.
3. Test decks.
4. Integrated test facility.
5. Audit module.
6. On-line auditing.
7. Audit software.

Briefly described, these techniques are:

1. Checklists

Checklists remain the introductory vehicles for the E.D.P. auditor to probe controls for potential weaknesses. To assure himself concerning the E.D.P. function, the auditor should evaluate three major areas of internal control: a) organizational controls, b) administrative controls, and c) procedural controls.<sup>29</sup> Most organizations have a checklist they work from; but for the novice, two general E.D.P. audit checklists exist. One is included in Gordon B. Davis's book "Auditing and E.D.P." and the other is in the Institute of Internal Auditor's "E.D.P. Manual."

2. Systems Approach

This approach is for the auditor to become directly involved in the design of the computer system. The auditor who involves himself in the design considerations of

<sup>29</sup> Richard C. John and Thomas J. Nissen, Evaluating Internal Control in E.D.P. Audits, (The Journal of Accountancy, February 1970, pp. 31-38), p. 32.

computer systems has a chance to influence control systems to the greatest possible extent at a time when comprehensive controls are economical to implement. In addition, the auditor gains a ground floor knowledge of the system and places himself in a position to use the computer in his audit to improve the information on which he bases his opinion.

- One of the proponents of this approach states that as E.D.P. systems expand in scope, more and more reliance must be placed on the system itself. Therefore, without this reliance, the auditor will be hard pressed to develop sufficient extended auditing procedures to permit the expression of an opinion.<sup>30</sup> .

### 3. Test Decks

One proponent considers this to be the most used and currently the most economical method of auditing through the computer.<sup>31</sup> In this approach, simulated problems or data using the client's programs are processed under the auditor's control. The auditor designs the test so that it will assure him the systems of controls are functioning properly. Both valid and invalid conditions are included in the test deck. Tests might include such items as invalid dates and account numbers, out-of-balance batches, as well as normal transaction. Results are precalculated by the auditor which he then compares to the computer-produced results to validate his tests.

### 4. Integrated Test Facility

Basically a variation of the test deck approach. Covered in detail in Chapter III.

### 5. Audit Module

In a computerized audit environment characterized by data banks and ingenious designs, the auditor must have the ability to access and extract data before he can perform any specific audit procedure. The command language to do this has not yet been fully developed.<sup>32</sup> What can then be done is to have an auditor's function built as an integral

<sup>30</sup> Michael R. Moore, E.D.P. Audits: A Systems Approach, (Arthur Young Journal, Winter 1968, pp. 4-15), p. 15.

<sup>31</sup> Richard C. Johns and Thomas J. Nissen, op. cit., pp. 35-36.

<sup>32</sup> H. J. Will, Computer-Based Auditing, (Canadian Chartered Accountant, February 1972, pp. 29-34), p. 34.

part of the computer system. For example, a customer confirmation routine could be built into the accounts receivable system. It need then only be activated by the auditor, or by his predetermined specifications, and it will produce confirmations at the same time as the Company's accounts receivable records are being updated. Needless to say, it requires the auditor to become involved in computer systems design.

## 6. On-line Auditing

An on-line system can be defined as one in which there is direct interaction with the central processing unit of the computer. The main difference between an on-line system and a traditional ledger or batch-processing system derive from the fact that information is stored within the on-line computer system. Normally the computer printout, familiar to the auditor, will no longer exist. Therefore, those audit techniques<sup>33</sup> relating to the records will have to be changed. Those areas not affected by records, such as confirmation of receivables and observation of physical inventory, the auditor will find that the traditional audit techniques will still be effective. However, for the new areas effective techniques do not yet exist. Articles ask for and promise that new techniques will become available to the auditor.<sup>34</sup>

- Again the major problem area of an on-line system would appear to be internal control. The internal control evaluation takes on even greater importance in an on-line system because the extensive reference to source documents and support records used in a traditional audit will not be feasible in an on-line system. The auditor must rely much more heavily on the accounting records themselves; therefore, he must have greater assurance of their accuracy.

## 7. Audit Software

The special purpose programs and generalized computer software that enables the audit to extract data from computer files. This topic is covered in detail in the next section.

<sup>33</sup> William F. Lewis, Auditing On-line Computer Systems, (The Journal of Accountancy, October 1971, pp. 47-52), pp. 48-49.

<sup>34</sup> Ibid., p. 50.



To summarize and to give an appreciation of the usage of these techniques, the following summation of replies in this area to a dissertation questionnaire is included:<sup>35</sup>

TABLE I

Audit Techniques Utilized in Firms With An Internal Audit Activity  
For the Evaluation of Internal Controls in Computerized  
Finance and Accounting Systems

	Firm Size Category <sup>a</sup> Sales in Millions				<u>Total</u>
	<u>50-100</u>	<u>100-250</u>	<u>250-500</u>	<u>Over 500</u>	
Total Respondents	18	43	42	90	193
Percent of respondents in each category using the technique					
A. Completion of a controls questionnaire	38.9	48.8	54.8	63.3	
B. Direct observation of data processing's employees	55.6	51.2	64.3	72.2	
C. Manual comparison of selected output with an expected output determined before computer processing	50.0	74.4	81.0	75.6	
D. Computer evaluation of various files and account balances using generalized audit programs	55.6	39.5	45.2	47.8	
E. Computer evaluation of program controls through test data with built in error conditions	27.8	23.3	26.2	36.7	
F. Other <sup>b</sup>	11.1	11.6	4.8	8.9	

<sup>a</sup>The Differences between categories are not statistically significant at the .05 confidence level.

<sup>b</sup>There were 17 "Other" responses. Most were essentially slight variations of Techniques A, B, and C above. Several reported what amounts to "Trouble Shooting"--i.e., "Tracking down problems after trouble has occurred."

<sup>35</sup> Francis A. Cooch, op. cit., Table 10.

• 5. Audit Software

The most dramatic illustrations of the impact EDP has had on auditing is found in those cases where the auditor has used the computer as a tool in his examination. In the mid 1960's, the approach most auditors used was to specify a special computer program for the auditor. Such programs could either be prepared by the auditor or by the company personnel. At that time the latter was considered more desirable because it avoided the need of the auditor to learn programming.<sup>36</sup>

However, the auditor's desire for independence created a demand for a capability for the auditor to create his own audit extract programs. The complexities of the computer made it impractical to train the auditor in programming. So in 1967, Haskins & Sells developed the first generalized audit software system called Auditape.

The object of Auditape was to fill the need for computer programs that can be used effectively and efficiently by auditors.

• The Auditape manual describes the conditions for using Auditape as follows:

- a. To be used "by persons having no specialized knowledge of computers or programming languages, and having only a nominal amount of simple instruction" and to be used
- b. "on a wide variety of records interchangeably, without any need for preparation of special programs for each type of application to be processed."<sup>37</sup>

<sup>36</sup> Kenneth G. Cadematori, The Impact of EDP on Auditing, (EDP and the Auditor, AMA Bulletin 81, 1966, pp. 12-19), pp. 12-13.

<sup>37</sup> Haskins & Sells, op. cit., p. 1.

The programs produced by systems like Auditape can perform a variety of computational or comparison tasks for which quantitative

- criteria can be established. Some general examples of these types  
38  
of tasks in auditing are:

1. Testing extensions and footings
2. Summarizing data and performing analyses useful to the auditor
3. Examining records for quality-completeness, consistency, invalid conditions, etc.
4. Selecting and printing confirmations
5. Selecting and printing audit samples
6. Comparing the same data maintained in separate files for correctness and consistency
7. Comparing audit data with company records.

A common characteristic of these applications is the fact that the auditor can define clearly and precisely what is to be computed, compared, summarized, printed, etc.

Some more specific examples of applications within the above  
39  
categories are:

1. Scanning a 10,000-item perpetual inventory file, printing out all items over \$20,000 and every two hundredth item, to test quantity and standard cost. Checking all extension and footing of inventory file. Printing out all items with a credit balance.
2. Matching file of cash disbursements in first 20 days of January with accounts payable file at December 31. Printing out all disbursement items that do not match for test of unrecorded liability.
3. Comparing standard cost file at beginning of year with end-of-year cost file. Printing out all standard costs that vary more than 10% for test.
4. Matching cash receipts after year-end with an A/R file to substantiate the collectibility of account receivables at year-end.

<sup>38</sup> W. Thomas Porter, Jr., Generalized Computer Audit Programs, (The Journal of Accountancy, January 1969, pp. 54-62), p. 54.

<sup>39</sup> John J. O'Donnell, Jr., op. cit., p. 12.

Currently all the major CPA firms have their own software package. Many thousands of dollars have been spend developing some 15 generalized audit software systems for auditors. These packages are offered to the general public for their use at nominal rental or purchase prices.

The systems are all similar in purpose and all have basically the same goals and objectives as did Auditape. They are being used by auditors with minimal training, but these auditors all have access to computer programming personnel for advice and for assistance, should they run into problems in getting the programs operational.

One of the newer systems is Computer File Analyzer which was developed by Price Waterhouse & Co. They recommend that to use Computer File Analyzer (CFA), the auditor must first determine which computerized file contains the data of interest to him and then he must perform these five steps:<sup>40</sup>

First, descriptive information must be gathered as to the contents of the records in each file (generally referred to as a record layout), how the records are physically stored, and what the physical devices are at the computer installation.

Next, the auditor must decide specifically what audit tests to perform using the information contained in the records. This is a most critical step, since here the auditor must determine what tests are relevant to his overall audit objectives (more will be said on this subject further along in this article).

Third, the CFA program(s), made up of the necessary Control Statements to carry out the audit tests, must be written and keypunched.

<sup>40</sup> Donald B. Chandler and John H. Mullin, Solving the "Invisible Record" Problem, (Price Waterhouse Review, Summer/Autumn 1971, pp. 1-11), p. 6.

Fourth, using the CFA on the company's computer, or at a service bureau installation, a diagnostic run must be made to locate and list, for correction, any errors in the Control Statements.

Finally, a test run should always be made against part of the file to be tested -- say, 100 records -- and the results reviewed carefully to make sure that sound logic was used in writing the programs and that the information the company provided as to its files is complete and accurate. These two points are vitally important because flaws in either can result in incorrect results as well as wasted computer time in processing the entire file.

Once a satisfactory test run has been accomplished, the auditor is ready to run his CFA programs against copies of the complete files.

The ability of the auditor to work directly with the computer has greatly improved rapport between auditors and EDP personnel because the main communication barriers of terminology and involvement have been eliminated.<sup>41</sup> Using audit software, the auditor works directly with systems and operations personnel, at a peer level, to obtain the information he wants for audit purposes. His audits are as good as his imagination, he is no longer constrained by what others will or will not do for him.

## 6. AICPA Role

One would expect to receive guidance and standards of conduct from the AICPA on computer audits. Although they have wrestled with the problem over the years in some depth, their progress through 1966 was summarized by Wayne S. Boutell as follows:

"It is significant that the Auditing Procedures Committee has made no official statement on the problems involved in auditing a business firm that uses the business-oriented computer for data processing. This silence can hardly be

<sup>41</sup> George F. Reid and James A. Demcak, EDP Audit Implementation With General Purpose Software, (The Journal of Accountancy, July 1971, pp. 35-46), p. 46.

justified on grounds of the recency of such usage. Ten years have allowed for enormous technological progress. Ten years have permitted the business information system trend to become abundantly clear. Ten years have made the needs for auditing innovation all but imperative. Ten years have made the opportunity more than evident."<sup>42</sup>

Six years have passed since Mr. Moutell made those allegations, and it is still significant that the Auditing Procedures Committee has made no official statement on the problem involved in auditing computer systems.

Let us look at what the AICPA has done in regard to computers.

The first major effort was to engage the System Development Corporation to undertake a six-month research program on the impact of computers on the public accounting profession. The results were published in a five-volume computer research studies. The topics of the volumes were Computer Survey Results, Current Basic Sources of ADP Information, Computer Applications to Accounting Operations, Relationships Among CPA's, Banks and Service Bureaus, and Software Trends-Hardware Characteristics.

The next effort was in March of 1966 when the then president of the AICPA, President Robert M. Trueblood, appointed a special Auditing EDP Task Force of Institute members with broad experience in auditing EDP to study the EDP problem. The result of the Task Force was the book Auditing and EDP.

The book has the following purposes:

1. To guide CPA's in auditing business enterprises which use computers for record keeping.

2. To provide a starting point for building a consensus of of expert opinion on auditing practices for examining such companies.
3. To suggest the utility and applicability of different auditing methods where experience is still lacking.
4. To provide source materials for training and informational purposes.

However, even though it was then and still is the major pronouncement by the AICPA on EDP auditing, Joe R. Fritzemeyer, Director, Technical Services Division, AICPA, put the following statement in the preface of the book, "This book is not intended to represent the establishment of auditing standards and procedures for EDP".<sup>43</sup>

The AICPA has appointed a Computers and Information Systems Committee to study the implications of electronic data processing for the accounting profession and to serve as an advisory group to the Institute in this area. This Committee has in turn established the following sub-committees:

Auditing EDP Systems  
Computer Operations  
Liaison with EDP Vendors and Professional Organizations  
Professional Development  
System Development and Exchange<sup>44</sup>

These committees to date have issued no standards of field work, although some are known to be under development. The major efforts of these committees has been the development and/or sponsoring of a variety of training courses. Among these training vehicles are:<sup>45</sup>

- a. The Annual AICPA Computer Conference
- b. Course entitled -- Computer Security and the Auditor's Responsibility

<sup>43</sup> Gordon B. Davis, op. cit., Preface.

<sup>44</sup> AICPA Committee Handbook, 1971-1972, p. 57-61.

<sup>45</sup> AICPA Catalog of 1972 Professional Development Courses.

- c. Course entitled -- Control of EDP Systems
- d. Course entitled -- Auditing EDP Systems -- A case study
- e. A Special Seminar -- What the Devil Can We Do About EDP

The professional is becoming more heavily involved in EDP auditing, unfortunately without any official guidance by the AICPA. Their efforts to date offer little encouragement that much can be expected in the near future in regard to this vital topic.

## 7. IRS Rulings

The impact which EDP has had on business practices and methods has had an equal effect on the Internal Revenue Service. In an address before the Controllers Institute of America, Mr. Singleton B. Wolfe, who at the time was Director of the Internal Revenue Services Audit Division, commented, "I feel we must give more attention to system analysis as we get into more complex computer operations."<sup>46</sup>

In the same talk, Mr. Wolfe discussed the desire to have IRS specialists in their field offices who are knowledgeable in EDP. He indicated that at that time (1966), a large number of revenue agents had already received indoctrination in auditing EDP systems.<sup>47</sup>

In the early years of EDP, there was concern over the loss of the audit trail and the validity of computer printout. Roy N. Freed summarized some of the problems in regard to the admissibility of computer printouts as evidence in court as follows:

<sup>46</sup> Benjamin M. Ablon, Record-Keeping and Legal Considerations, (EDP and the Auditor, AMA Bulletin 81, 1966, pp. 42-47), p. 42.

<sup>47</sup> Benjamin M. Ablon, op. cit., p. 42.



"Because computer records are novel, however, and because in many cases they are unreadable without expert interpretation, counsel seeking their admission in evidence should be prepared to go to greater lengths to lay a proper foundation for their admission than would be necessary in the case of conventional records. He should be able to negate, insofar as possible any doubts concerning their accuracy and the possibility of manipulation in their creation."<sup>48</sup>

In order to emphasize its concern in the area of EDP and to give taxpayers its assurance that IRS will accept computer-processed data it issued Revenue Procedure 64-12 for the guidance of taxpayers. Section 1 of this procedure sets forth the purpose as follows:<sup>49</sup>

- .01 The purpose of this Revenue Procedure is to set forth guidelines specifying the basic record requirements which the Internal Revenue Service considers to be essential in cases where a taxpayer's records are maintained within an automatic data processing (ADP) system. References here to ADP systems include all accounting systems which process all or part of a taxpayer's transactions, records, or data by other than manual methods.
- .02 The technology of automatic data processing is evolving rapidly; new methods and techniques are constantly being devised and adopted. Accordingly, the five points set forth in section 4 of this Revenue Procedure are not intended to restrict or prevent taxpayers from obtaining the maximum benefits of ADP provided the appropriate information is present or can be produced by the system. These guidelines will be modified and amended as the need indicates to keep pace with developments in automatic data processing systems.

The IRS since 1956 has premitted various data to be submitted to them on magnetic tapes.<sup>50</sup> However, because of the frequent questions raised by users and manufacturers of EDP equipment, as well as the previously cited reasons, procedure 64-12 was issued. One must bear

<sup>48</sup>Roy N. Freed, Computer Print-Outs as Evidence, (American Jurisprudence - Proof of Facts Annotated, Vol. 16, 273, 1965, pp. 299-300), pp. 299-300.

<sup>49</sup>IRS Revenue Procedure 64-12, Section 1.

<sup>50</sup>Benjamin M. Ablon, op. cit., p. 45.

in mind the 64-12 is only a recommendation as is not binding on the taxpayer.

In 1971, the IRS issued Revenue Ruling 71-20 regarding the validity of EDP records. This ruling is binding versus Revenue Procedure 64-12 which is a recommendation. The fact that 71-20 refers directly to 64-12 creates a situation on which the IRS refuses to comment.

Martin B. Roberts, an assistant professor at Georgia State University and consultant for the IRS, has had primary responsibility in creating and interpreting 71-20. He has authored two articles in the taxation section of The Journal of Accountancy which explain this ruling.

The ruling clarifies the IRS position with regard to whether or not punched cards and magnetic tapes are tax records. The IRS in 71-20 says definitely yes, thus permitting the IRS to use the computer to assist them in their audits.<sup>51</sup>

Revenue Ruling 71-20 states in part:

It is held that punched cards, magnetic tapes, disks, and other machine-sensible data media used for recording, consolidating, and summarizing accounting transactions and records within a taxpayer's automatic data processing system are records within the meaning of section 6001 of the Code and section 1.6001-1 of the regulations and are required to be retained so long as the contents may become material in the administration of any internal revenue law.<sup>52</sup>

This ruling raises a number of questions which Mr. Roberts tries to answer:<sup>53</sup>

<sup>51</sup> Gilbert Simonetti, Jr. Editor, Taxation, (The Journal of Accountancy, April 1971, pp. 76-79), p. 79.

<sup>52</sup> IRS Revenue Ruling 71-20.

<sup>53</sup> Gilbert Simonetti, Jr., Editor, Taxation, (The Journal of Accountancy, July 1971, pp. 77-81), pp. 77-80.

What EDP records should be kept and for how long? Use guidelines as stated in 64-12.

How is the IRS going to use the taxpayer's records? The taxpayer's EDP records that will be processed with the computer assisted audit techniques are essentially the same records that the agent would have worked with in hard copy format. The revenue agent's decision to use the computer for a particular audit task will ordinarily depend on the potential manpower savings for both the taxpayer and the IRS.

What procedures will the IRS follow in administering the new rulings? Each district of the IRS has established a focal point for receiving inquiries and for scheduling the taxpayers' EDP record evaluations. Special taxpayer situations will be worked out between the taxpayer and the IRS.

Obviously, the IRS is gearing up to become more active in using the computer as an audit tool. This perhaps is the impetus needed to push the auditing profession into action in the field of computer auditing.

### CHAPTER III

#### CONCEPT OF THE INTEGRATED TEST FACILITY TECHNIQUE

Auditors continue to search for audit techniques that will assure them that computer systems are under control. While it is doubtful that no one technique will provide the auditor complete assurance, the Integrated Test Facility (ITF) technique is by far the most promising audit tool to date for third and fourth generation computer systems.

The Integrated Test Facility technique (sometimes referred to as the mini-company approach) involves establishing the capability of introducing selected inputs into a system simultaneously with live data, and tracing the flow of transactions through the various functions in the system. The object is to permit control personnel to enter into an EDP system under normal operating conditions, test transactions for which the results have been predetermined and can be checked against the results actually produced.

Since the use of the ITF technique does not require an extensive understanding of computer technology, the technique can be readily used by both the external and internal auditors.

#### NEW TECHNIQUES NEEDED

In the computerized environment, the control function requires special attention. The removal of personnel from direct interaction with events and transactions and relying on computer systems, places a greater burden on control points throughout the organization. This

transition from men to machines has often created control gaps which have allowed costly mistakes to go uncorrected.

The solution to the problem of control in an EDP environment is to restructure control and audit techniques to complement the characteristics of the computer systems.

#### TEST DECKS REVISITED

One of the first major thrusts into developing techniques to insure that the internal computer systems mechanisms were functioning correctly was the test deck approach. This device required the preparation of an exhaustive set of transactions that would test most of the paths through a computer system.

The auditor would prepare his base case of transactions, then request a special computer run to process his test. The results of this run would be checked to verify the functioning of the computer system.

While this technique was effective, it suffered from the following disadvantages:

1. The test deck required computer time which was becoming more and more difficult to obtain. In the case of on-line real-time systems, it may not have been possible to "seize" the system while the test deck was being run.

2. Maintenance of test decks was costly and time consuming due to frequent changes to the programs.
3. The test deck concept required the auditor to have a detailed knowledge of such things as data layouts and file design.

However, for those computer systems which were batch oriented and subject to little change, the test deck concept appeared to be an effective technique to test the functions of the computer system.

#### ITF EMERGES

An innovation of the test deck concept is the Integrated Test Facility. It involves establishing the capability of introducing selected input into a system simultaneous with live data, and tracing the flow of transactions through the various functions in the system. This concept has proven to be very successful in the few companies who have already used it.

The major difference between the test deck approach and ITF is in how the test is run. In the test deck concept the transaction data and permanent data was prepared and run as an independent test, thus no company records were affected. Under the ITF concept, test transactions are mixed with normal company transactions and processed together.

The capability of entering test transactions under ITF requires the establishment of a fictitious unique entity unto which the data can be processed against. For example, this entity may be a fictitious division, store, dealer, department, employee, plant, subsidiary, account, or any other basis of accumulation of accounting information. Once this entity has been established, transactions can be processed against this entity using the normal company documents for such transactions. For example, if the entity is a company dealer, then orders can be entered from that dealer via any legitimate method of entering orders (e.g., purchase order forms).

Thus, under ITF no detailed knowledge of computer record formats is required, no special costly computer runs are required, and it is unnecessary to update test transactions as computer systems change.

The mixing of test transactions with transactions from normal operations creates the need at some point in company operations to filter out the amounts generated by these test transactions from the results of normal company business. Two approaches have been used to handle this situation, both of which require the test transactions to be uniquely identified.

The first approach used is to modify the computer programs so that they will segregate the test transactions prior to the generation of any accounting data affecting the books of the company. The second approach is to let the results of the test transactions become included in the results of operations, and at predetermined points during the year to reverse the results of the transactions via a journal entry or similar method.

The easiest to install and most powerful and flexible method is to leave the computer systems as they are, and then reverse the effects of ITF transactions via journal entries.

#### WHAT'S ITF ALL ABOUT

The complexity of computer systems, the loss of visible audit trails, the high volumes of data, and the inter-related nature of various computer systems, make it difficult to test internal control using the more historical view of auditing transactions after they occur. The concurrent nature of ITF provides a sound approach to the internal control question.

For the auditor to use the ITF, he may select a system he wishes to test, for example, the billing accounts receivable function in a system that has a large number of independent customers. The auditor then establishes himself as a customer of



the company he is auditing. The customer account would be established via the normal means with only as few people aware of the purpose of this account as possible. Also an outside address should be used.

The auditor then develops the sample test he wishes to pursue. For example, product would be ordered and shipped to the ITF customer account. The accounts are then billed for the product or service. The product could be expended or used in company operations, returned to stock, or even have the shipment stopped in the shipping area depending on the nature of the product.

From this point the auditor determines what peripheral checks he wishes to make. For example, bills can be paid, over or under paid, or not paid. Items can be returned for credit, complaints processed, credit terms violated, or any other type test of operations that the auditor cares to try. The auditor is only limited by his imagination.

The power of ITF then is the ability to test the flow of data from system to system, and the ability to verify for the test account, the accumulation of statistics for a week, month, or annual report. If the test account is accumulated correctly, the auditor has some assurance that all the required data files were included in the update runs, and that the accumulation routines were operating correctly.

### OPERATING THE ITF

There are two general methods of operating the ITF. Each method presents certain advantages.

1. Live transactions involve submitting actual work. This is when work is submitted via the normal means for entering input to the system (e.g., purchase order forms).
2. Dead transactions are fictitious events inserted at some point within the system. This method is effective when large expensive products are involved or large quantities of product.

An example of the second method would be to prepare input data (punch cards) representing a transaction. These cards would be placed in the job stream or at some point in the DP Department. The major advantages of each method are listed below.

### ADVANTAGES OF DIFFERENT OPERATING METHODS FOR ITF

#### LIVE TRANSACTIONS

- 1) Test the entire scope of the system (e.g., order entry to cash receipts).
- 2) Create no awareness among operating or supporting personnel that a system test is occurring.
- 3) Provide a technique to verify work status of operations outside home office.

#### DEAD TRANSACTIONS

- 1) Provide an unlimited range of products and services to be tested.
- 2) Allow testing of other controls and error reporting by insertion of faulty data.
- 3) Simplify ITF recordkeeping by eliminating cash and product handling.

Note that these methods of operating ITF assume movement of product as a result of live transactions, and no movement of product using dead transactions. Live transactions would be reversed by journal entries, and dead transactions reversed by credits.

#### ADVANTAGES AND DISADVANTAGES OF ITF

Ideally, the Integrated Test Facility should be treated like an independent entity. In other words, the test media should be handled as though the computer system were performing an identical operation for an independent entity. A separate set of statistics and reports would, therefore, be developed ensuring that the test material does not interfere with any cumulative statistical reports involved in the system. The auditor, of course, must work closely with the systems people in order to have such audit capability.

The Integrated Test Facility offers the following advantages:

1. Using this concept the auditor would not require additional computer time since his material would be processed simultaneously with live media. This factor is becoming increasingly important as computer time becomes more and more difficult to obtain.
2. It would enable the auditor to make periodic reviews of the system whenever he felt such reviews were warranted. For example, the auditor would have little difficulty in verifying

the accuracy of billing charges immediately after a rate change or in verifying the accuracy of a payroll operation which had to make large scale wage adjustments due to changes resulting from new pay plans.

3. It would enable the auditor to check the statistics gathering and reports preparation logic of a computer system. This is not possible with the "around" the computer approach. For example, it would be quite possible to process a pay draft correctly, but incorrectly accumulate annual tax data, cumulative wages, etc. Without tracing 100% of the pay drafts to the statistics data, it is impossible to determine that an individual item was included. There are probably other ways to check the reports and statistical data, but it appears that each would require additional computer time or additional output reports.
4. This technique would not require the costly and time consuming maintenance that a conventional test deck does since input documents would be used to introduce test media into the system. With this concept, changes to the test media would be in the form of easy-to-make additions or deletions.
5. With this concept, an audit staff would require only a relatively small group of "computer experts" to assist the regular auditors in the phases of the audits where computers are utilized.

6. The technique is effective in a real-time EDP environment.
7. Cost very little to install and operate. (Assumes no program modification.) The auditor uses the same means of entering data into the computer system as any other user of that system.

The Integrated Test Facility is limited by the following

• disadvantages:

1. The added costs for program modification would be well in excess of the time savings. (Assume program modification required.)
2. Some systems are so varied and complex that introducing test input simultaneously with live data would endanger the processing routine.
- 3. At present there are not many true on-line real-time systems and many feel that this technique is particularly appropriate to that type of environment.
4. There is a strong concern that incorrect data or handling might cause problems with live data that would not be found and accordingly not corrected.
- 5. Many feel that better results can be obtained with other test methods requiring less time, controls and expense, (e.g., when testing for program validity, sophisticated test decks or general purpose computer programs are easier to use and provide similar results).

- 6. Many data processing groups strongly object to modifying programs to filter out test data; they feel the risk is too great in proportion to the benefits.
- 7. Many financial officers object to having fictitious amounts in the company records, and then reversed by journal entries, and/or program modification.

## CHAPTER IV

### HYPOTHESIS UNDER CONSIDERATION

Mainly via word of mouth (e.g., meeting, conferences, seminars, etc.) the concept of the Integrated Test Facility has been disseminated. The library research undertaken as part of this project failed to disclose any book, article, or even mention of the ITF technique.

Since brief oral descriptions, possibly by individuals who never used the technique, is bound to lead to misunderstandings, confusion and the need for original research, one could assume the technique might not be widely utilized. Thus the hypothesis.

### HYPOTHESIS UNDER CONSIDERATION

The Integrated Test Facility approach is a computer audit technique that is well-known in concept by most of the companies that engage in auditing of computer systems, but that the ITF technique has yet to gain their acceptance and usage.

### SUB-HYPOTHESIS IF THE ABOVE IS TRUE

The primary reason for the lack of acceptance on the part of companies engaged in auditing of computer systems is due to not understanding how to deal with the potential problems associated with this technique.

The main hypothesis deals with both the understanding as well as the current use being made of the technique, while the sub-hypothesis is concerned with the reason for non-use.

For purposes of the main hypothesis, if 90% of the companies engaged in computer auditing have heard of the technique, it would be assumed to be well-known; and if less than 10% of the companies use the technique it would be assumed that the technique has failed to gain acceptance as a good audit technique.

The sub-hypothesis proposes that the disadvantages of ITF (as outlined in Chapter III) are sufficient to prohibit the use of ITF in the computer systems of potential users.



CHAPTER V  
RESEARCH METHODOLOGY

One of the newer and more promising techniques to appear in the field of computer auditing is the Integrated Test Facility. For this reason a survey was conducted to ascertain the awareness, appreciation, and acceptance of this technique among the profession.

A questionnaire was prepared on this subject and mailed to 200 of the largest industrial, banking, utility and insurance companies in the U.S. The objective was to test the hypothesis under consideration which briefly stated is: 1) to determine if the technique is known and being used, and 2) if it had been studied and rejected, what were the reasons for the rejection.

A survey was recently conducted to determine the involvement of firms, by size, in EDP auditing. The results of that survey showed that the larger firms are way ahead of the smaller ones in organizing an independent activity for evaluating data processing. The discrepancy as illustrated in Table I (page 10) shows that in the \$50-100 million of sales category only 9.8% have EDP audit functions, while in the over \$500 million of sales category the percentage jumps to 60.6%.

For this reason it was decided to concentrate mailing the questionnaire to the larger companies in the United States. A small random sample of the smaller firms was added to try and validate Mr. Cooch's hypothesis, as illustrated in Table I.

The population for the sample was the Fortune 500 for industrial firms, Fortune's list of largest banks, utilities, and insurance companies for the year 1971. The sample was comprised of the following:

<u>TYPE</u>	<u>NUMBER</u>
largest 100 industrial corporations	100
largest 25 banks	25
largest 25 insurance companies	25
largest 25 utilities	25
random sample of 25 smaller companies from the above categories which were included in Fortune Magazine's lists for 1971	<u>25</u>
	200

The size of the sample was selected for two purposes:

1) to test the hypothesis under consideration; and 2) provide a base for further research.

The questionnaire was mailed by the American Institute of Certified Public Accountants, on their stationery, under the name of the Committee on Auditing EDP systems, of which this author is a member.

## QUESTIONNAIRE

Because the ITF technique is new, and the questionnaire was testing for understanding and acceptance, a cover letter was attached which briefly explained the ITF computer audit technique. The letter also briefly explained the goals and objectives of the project. The cover letter and questionnaire are included as Appendix A to this paper.

The questionnaire was purposely kept short so that it would take a minimum amount of time to fill out -- hopefully in the 10-15 minute range. It was felt this would help encourage more replies.

The questionnaire was mailed to the comptroller or chief financial officer of the companies being surveyed. The letter noted that if they were not the appropriate person in their company to answer it, to pass it on to the individual they felt best suited to respond. While it was not felt that the chief financial officer was the best person to respond, it was felt that if he passed the questionnaire down the chain of command there was a good chance it would be completed and returned.

## DIRECTIONS

The questions were set up so that only an "X" need be placed beside the answer that best described their company's position regarding that question. However, room was left for amplification of answers and comments if the respondent so desired.

It was not necessary for the respondent to put his name or company's name on the questionnaire, and no attempt was made to secretly code the questionnaire to show from whom it was mailed. However, room was provided for the respondent to add his name, his company's name and to indicate if he would like to participate in further research on this topic.

No return envelope was enclosed; this was at the option of the AICPA.

#### QUESTIONS

There were seven questions on the questionnaire. Following is the logic behind each question:

1. The object of this question was to determine the type of business the respondent was engaged in so that it could be determined if there was any correlation between type of business and the other answers.
2. The second question asked if the respondent used the ITF technique in his company.
3. If the ITF technique was not being used then this question probed to determine the reason. If the technique had been explored and rejected, the respondent was asked to note the reason. This would provide the basis of determining, in the eyes of potential users, the major drawbacks to ITF as they saw them.

4. If the ITF technique was being utilized, this question was aimed at obtaining information on how it is used. The main objective was to obtain information for further research and to obtain supporting information to help explain the uses of and to help promote the ITF technique.
5. This question was optional, which provided room for the name and title of the respondent, as well as the name, address, and phone number of his company.
6. Question six asked if the respondent would like to become involved in further research on this subject.
7. Question seven provided room for the respondent to add any other type of comment he may care to. This was to provide for anything the respondent may care to reveal that wasn't covered elsewhere in the questionnaire.

#### MAILING

The questionnaire was mailed in early June by the AICPA. A small second mailing of about 15 questionnaires was sent out in early July. The second mailing covered questionnaires returned because the addressee had changed jobs, plus a few selected companies that were felt to be using the technique.

CHAPTER VI

RESULTS OF RESEARCH

The response to the ITF questionnaire was sufficient to draw some conclusions (95 replies for 200 questionnaires mailed). The responses showed a lot of study and consideration had been given this technique by the majority of the respondees. The results of the survey are summarized in Appendix B.

HYPOTHESIS UNDER CONSIDERATION

The hypothesis under consideration was that the ITF technique was well known but seldom used. The first part of the hypothesis implied a 90% or greater recognition, and the second part implied a usage of 10% or less. Based on the responses, the first part of the hypothesis (89 of 95 had heard of the technique) can be accepted at both the 5% and 1% level of significance. Based on the number of respondents that indicated they were users of the ITF technique (14 out of 95), the second part of the hypothesis can be accepted at the 5% level of significance; however, it must be rejected at the 1% level.

The sub-hypothesis is that the reason ITF has not gained a larger usage is due to a lack of understanding in how to deal with the disadvantages of the technique. If we accept the main hypothesis at the 5% level, then we can speculate on the merits of the sub-hypothesis. Sixty-one percent of the companies responding that had heard of the technique and were not using it either felt the

technique was not worth investigating or had investigated the technique and rejected it for a variety of reasons. Thus it appears that this sub-hypothesis also can be accepted.

However, caution should be exercised in accepting the hypothesis that the technique is only being used in a small number of companies. Among those respondents that had heard of the technique and weren't using it, 22% had it under investigation and an additional 17% were contemplating its use after investigating the ITF technique. This implies a large number of companies are on the borderline in regard to using the audit technique. Over half of the respondents desired to discuss the technique further either by phone call or visit. Of the 14 companies using the technique, 12 wanted to follow up for further discussions.

#### SURVEY QUESTIONS

In addition to the segment of the questionnaire devoted to testing the hypothesis, several other questions were asked to provide background information and to become the basis for further research. A short synopsis of how ITF is being used will illustrate the results of these survey questions. The synopsis pertains to those 14 companies who use the ITF technique.

Most ITF users have been using the technique over two years. They split equally on the program modification concept versus adjusting journal entries to remove test data from the normal company operations. The auditors administered the technique in about half of the companies with either the EDP personnel or the system user

administering the other half. In two cases it was the external auditor who used the facility. Only 3 of the users indicated that movement of company product was a part of using the ITF audit concept.

All types of financial systems had the ITF concept associated with them including such varied systems as payroll, cost accounting, and stockholder records. All users were satisfied with the results obtained from ITF with 11 of 14 indicating they planned to expand the use of the technique in their company. Only one company indicated difficulty in implementing the technique and none indicated they had any legal complications.

The important benefits derived varied between companies. Some showed interest in expediting audits and achieving better and more reliable audits while others showed more interest in the EDP aspects of checking program changes and continuous testing. The difference in philosophy was related to the group that administered the technique.

#### SURVEY COMMENTS

The statistical summary only tells half the story. The question on benefits to be obtained by using this technique and the question on the reasons for not adopting the technique allowed space for comments. The following comments recap the experiences of those companies who have evaluated ITF.



For ease of interpreting the comments, they are divided into three categories: 1) those that are using ITF and the benefits that they have derived, 2) those that have investigated ITF and have for the time being decided not to use the technique, and 3) those in the process of installing the technique.

1. Benefits Derived From ITF (Quotes from Respondees)

- Ability to continually test the live operation of a system.
- Enhance the accuracy and soundness of data systems involving the financial and physical assets of the corporation.
- Improvement in auditing efficiency.
- Reasonable assurance that programs are operating as anticipated.
- The auditor would not require additional computer time since his material would be processed simultaneously with live media.
- Faster identification of processing problems.
- Cost very little to install and operate. (Assumes no program modification.) The auditor uses the same means of entering data into the computer system as any other user of that system.

2. Reasons for not Currently Using the Technique (Quotes from Respondees)

- Added costs (for program modification) would be well in excess of the time savings.
- Our systems are so varied and complex that introducing test input simultaneously with live data would endanger the processing routine.
- At present, we do not have any true on-line real-time systems and feel that this technique is particularly appropriate to that type

of environment.

- Rejected because of concern that incorrect data or handling might cause problems with live data that would not be found and accordingly not corrected.
- Better results can be obtained with other test methods requiring less time, controls, and expense, i.e., if we're testing for program validity, sophisticated test decks or general purpose computer programs are easier to use and provide similar results.
- We currently use audit software on a selective basis.

### 3. Potential Users Speak (Quotes from Respondees)

- We feel it is a worthwhile technique, and it will be considered in all future EDP systems.
- Have worked on this technique for a long time. Progressed to a point where we now expect to have it going for two on-line systems shortly.
- The data derived from this survey should provide the information needed to make a decision, thus far we have not been able to gather any significant feedback on this concept.

### SURVEY CONCLUSIONS

The results of the survey indicate that, at least among the large companies, ITF in concept is a known idea but one which is approached with caution. There is no doubt that as an audit technique ITF is still in the developmental stages. Some companies use the technique very successfully while others shun the concept for fear of the problems associated with it.

However, certain conclusions can be drawn from the survey and are herewith presented:

1. ITF is either being used or in the process of being installed in all the types of businesses surveyed.
2. ITF is being utilized in all major computerized financial applications.
3. The problems associated with ITF have been successfully overcome by a variety of users.
4. The major problem with the ITF technique is removal of the test transactions from the live data. Of the two techniques to accomplish this removal, program modification and reversing journal entries, program modification is costly and reversing journal entry is often a concern to financial officers.
5. Those companies using the reversing journal entry method to remove the results of test transactions have not had any problems.
6. No major legal problems have been encountered to date in using this technique.
7. External auditors have been hesitant to use ITF because of the potential problems associated with the contamination of the client's data base. However, ITF has been used by external auditors. Prior to external auditors using ITF, they might want to determine that adequate backup files are available. This greatly reduces the risk of file contamination.

- 8. The major handicap to the expanded use of ITF is the lack of understanding of the technique and of the variety of methods of implementing and operating ITF by auditors, financial and data processing management.

This project has shown the state of the art as it exists for the ITF audit technique. It appears to be a well known technique, at least among the large companies. However, to date the technique has not been widely used but appears to be gaining acceptance.

CHAPTER VII

IMPLICATIONS TO THE PROFESSION

To many, the computer is the dominant advance of the 20th Century. To the auditing profession, the computer could be described as the dominant problem of the 20th Century. Certainly the profession has not ignored the computer; but on the other hand, they have yet to provide the practitioner with the first standard of field work as a guide in performing audits of computer systems.

This research project has yielded four needs which, in the opinion of this author, require action by the auditing profession. Two of these needs are in the area of audit standards while the other two relate to the research done on the ITF audit technique. The four needs are:

1. Develop and issue standards of field work for audits involving computer systems.
2. Establish a professional committee to specify and implement a common computer audit software package for the auditing profession as a standard audit tool for the practitioner to use in audits of computer systems.
3. The newer computer audit techniques (e.g. the Integrated Test Facility) should be publicized by the profession and generally made available for those auditors currently struggling with the task of auditing computerized systems.

4. The profession should actively encourage management of organizations to accept the concepts of the newer audit techniques (e.g. the Integrated Test Facility). And where the use of such techniques require unusual accounting, such as adjusting journal entries, the profession should encourage such practices in order to improve the quality of audits.

Within the profession there are encouraging pockets of progress as have been shown by this research project. However, the progress of computer auditing has lagged far behind the progress of the computer industry.

The profession needs to act on the above needs, and one might conclude the implications to the profession on its failure to act on the computer segment of auditing by paraphrasing a famous American as follows: I want to make this perfectly clear, today is the time for the profession to act and take the lead for tomorrow might be too late.

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## APPENDIX A

### EVALUATION INSTRUMENT



## AMERICAN INSTITUTE OF CERTIFIED PUBLIC ACCOUNTANTS

666 FIFTH AVENUE

NEW YORK, N. Y. 10019

Dear Colleague:

The Committee on Auditing EDP Systems of The American Institute of Certified Public Accountants is studying computer audit techniques. One of particular interest is called the integrated test facility (sometimes called the mini-company concept).

The Integrated Test Facility involves establishing the capability of introducing selected input into a system simultaneously with live data, and tracing the flow of transactions through the various functions in the system. The object is to permit control personnel to enter into an EDP system under normal operating conditions, test transactions for which the results have been predetermined and can be checked against the results actually produced.

Ideally, the Integrated Test Facility should be treated as an independent entity. In other words, the test media should be handled as though the computer system were performing an identical operation for an independent entity. A separate set of statistics and reports would, therefore, be developed ensuring that the test material does not interfere with any cumulative statistical reports involved in the system. The control personnel, of course, must work closely with the system people in order to develop such audit capability.

In order to study the knowledge, acceptance, and use of this technique, we would appreciate your filling out the short questionnaire attached. However, you may feel after looking at the questionnaire that you are not the appropriate person in your company to answer it. If so, we would appreciate it if you would pass it on to the individual you feel best suited to respond.

Your participation in completing this questionnaire will aid the Committee in its work. Your company name will not be associated with the results of this survey. We appreciate your assistance in completing this questionnaire.

The results of this questionnaire will be summarized and published in a future Journal of Accountancy article.

Sincerely yours,

*Richard W. Cutting /JB*

Richard W. Cutting, Chairman  
Committee on Auditing EDP Systems

RWC/jb  
Attachments (1)

## Integrated Test Facility Questionnaire

### Instructions to Respondents:

Place an "x" in the box alongside the answer that best describes your company's position. Answer all questions as of the date you are completing the questionnaire.

1. Type of business (e.g. insurance, manufacturing, banking, etc.) \_\_\_\_\_
2. Is the subject technique currently being used in your company? Yes ☐ No ☐
3. If your answer to question number 2 was no, please indicate the following that apply to your company.
  - a. The technique has been explored and it has been decided not to use it. (Please note reasons below). ☐
  - b. We are currently investigating its use. ☐
  - c. We use a similar technique. ☐
  - d. We had not heard of this technique. ☐
  - e. It has never been considered. ☐
  - f. We would like to consider its use. ☐

Amplification of above (if appropriate):

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If your answer to question 2 was "yes" - please answer the remaining questions.

4.

- a. Who is responsible for administering the technique?

internal auditors ☐ EDP personnel ☐

external auditors (CPAs) ☐ other ☐

- b. Did computer programs have to be modified to make this technique operational? Yes ☐ No ☐

- c. Is use or movement of your company product involved in the operational aspects of this technique? (For example, do you "purchase" company products and trace these transactions through the computer system?) Yes ☐ No ☐

- d. What applications are audited using this technique?

billing ☐ payroll ☐

receivables ☐ payables ☐ other ☐

inventories ☐ cash ☐

- e. Do you plan to expand the use of this technique in your company? Yes ☐ No ☐

- f. Are the financial results of operating the Test Facility incorporated into your financial records? Yes ☐ No ☐

If so, do you make adjusting entries to your records to reverse the effect of these operations?

Yes ☐ No ☐

Comments if any \_\_\_\_\_

\_\_\_\_\_

g. How long have you been using this technique?

less than 1 year ☐ 1-2 years ☐ 2-4 years ☐  
over 4 years ☐

h. Are you satisfied with the results? Yes ☐ No ☐

i. If you are satisfied with the results what important benefits have been derived?

\_\_\_\_\_  
\_\_\_\_\_

j. Have you had any serious difficulties in implementing this technique? Yes ☐ No ☐

Explain if yes \_\_\_\_\_  
\_\_\_\_\_

k. Are there any legal complications which concern you? Yes ☐ No ☐

Explain if yes \_\_\_\_\_  
\_\_\_\_\_

Description of respondent (optional):

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

Phone Number \_\_\_\_\_



6. Would you be available for a follow-up phone call or a visit to discuss the questionnaire, if necessary?

Yes ☐ No ☐

If yes - Phone call ☐ Visit ☐

7. Other comments.

## APPENDIX B

### RESULTS OF SURVEY

RESULTS OF SURVEY  
INTEGRATED TEST FACILITY

Questionnaires Mailed 200

Responses Received 95

I. General Results

A. Companies using the Integrated Test Facility 14

B. Companies who have investigated ITF but are not using  
the Integrated Test Facility for the following reasons:

1. Technique explored and not used because:

a. Other techniques used	10
b. Programs required changes	5
c. Insufficient cost benefits	6
d. Use a similar technique	6
e. Other reasons (e.g., lack of computer time, complexity of system and possible problems, etc.)	10

2. Technique under investigation 16

3. Never heard of 6

4. Never considered 9

C. Companies not presently using the technique but  
contemplating its use 13

Total Responses 95

II. Results for Those Companies Using the Integrated Test  
Facility

A. Responsibility for administering the technique:

Internal auditors	7
External auditors (CPA's)	2
Users	3
EDP personnel	<u>5</u>
	17

Note: In some companies more than one group  
administers the technique.

RESULTS OF SURVEY

INTEGRATED TEST FACILITY

B. Computer programs had to be modified:

Yes	7
No	<u>7</u>
	14

C. Movement of company product involved in technique:

Yes	3
No	<u>11</u>
	14

D. Applications audited using this technique:

Billing	6
Receivables	4
Payroll	6
Payables	4
Stockholder Accounting	1
Inventories	2
Property	1
Report Preparation	1
Training New Staff	1
Cash	1
Cost Accounting	<u>1</u>
	26

E. Company plans to expand this technique:

Yes	11
No	<u>3</u>
	14

F. Financial results of technique incorporated in financial records:

Yes	4*
No	<u>10</u>
	14

G. Technique used for:

Less than 1 year	2
1 - 2 years	1
2 - 4 years	6
Over 4 years	<u>5</u>
	14

H. All were satisfied with the results.

\* All but one required adjusting entries.

RESULTS OF SURVEY

INTEGRATED TEST FACILITY

I. Important benefits derived:

Expedites audit	5
Continuous testing	3
Better internal control	2
Checks program changes	4
Reliable and better audits	2
Faster identification of problems	1
Enhances accuracy of results	1

J. Difficult in implementing:

One company had to check all program changes to make sure audit transactions didn't contaminate the live files.

K. No company had any legal complications.

RESULTS OF SURVEY

INTEGRATED TEST FACILITY

BY TYPE OF BUSINESS

	All Replies	REPLIES BY TYPE OF BUSINESS				
		<u>Petroleum</u>	<u>Manufacturing</u>	<u>Utility</u>	<u>Insurance</u>	<u>Banking</u>
1. Companies using ITF	14	0	9	3	2	0
2. Companies who have investigated ITF but are not using ITF for the following reasons:						
A. Other techniques used	16	1	8	1	1	5
B. Insufficient cost benefits (programs required modification)	11	1	3	1	3	3
C. Other reasons (e.g., complexity of system, possible problems, and not using on-line programs)	<u>10</u>	2	2	0	4	2
	37					
3. Technique under investigation	16	3	6	4	2	1
4. Companies contemplating use of ITF	13	2	7	0	3	1
5. Never heard of or considered	<u>15</u>	<u>2</u>	<u>7</u>	<u>2</u>	<u>4</u>	<u>0</u>
Total Responses Received	<u>95</u>	<u>11</u>	<u>42</u>	<u>11</u>	<u>19</u>	<u>12</u>